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Claims

What is claimed is:

1. In a system comprising two communicating devices, a method of communication comprising:  
creating information packets, each of which has an assigned known order  
number from a plurality of order values;  
organizing the order values in a predetermined order which the information packets must be transmitted and received in;  
transmitting the information packets in successive packets solely in accordance with the predetermined order from a first of the two communicating devices to a second of the two communicating devices;  
successively checking and verifying that each of the information packets which is received is being received pursuant to the predetermined order; and either
  - (1) accepting in the predetermined order each received information packet by providing an acknowledge response from the second of the two communicating devices to the first of the two communicating devices; or

5 (2) rejecting a specific information packet by providing the acknowledge  
response, the rejecting forcing the first of the two communicating  
devices to determine which specific information packet was rejected  
and to resend the specific information packet which was rejected  
until the specific information packet is accepted by the second of the  
10 two communicating devices.

2. The method of communication of claim 1 further comprising:  
upon the first of the two communicating devices receiving the  
acknowledge response indicating acceptance by the second of  
15 the two communicating devices of a predetermined  
information packet, tracking the plurality of order values to  
indicate which of the plurality of order values is a next  
expected order value.

20 3. The method of communication of claim 1 further comprising:  
detecting at the second of the two communicating devices that the  
specific information packet does not have a correct order value  
or that there are errors associated with the specific information  
packet which was received;

5 sending the acknowledge response to the first of the two  
communicating devices indicating said detecting;  
responding to the acknowledge response by having the first of the  
two communicating devices request the second of the two  
communicating devices to transmit a present order value of  
10 the second of the two communicating devices; and  
forcing the first of the two communication devices to retransfer one  
or more information packets beginning with the present order  
value provided by the second of the two communicating  
devices.

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4. The method of communication of claim 1 further comprising:  
detecting at the second of the two communicating devices that no  
errors exist associated with the specific information packet  
which was received;

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determining that the specific information packet could not be  
accepted due to an inability of the second of the two  
communicating devices to store the specific information  
packet;

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providing the acknowledge response to the first of the two  
communicating devices indicating the specific information

5 packet which could not be accepted by the second of the two  
communication devices; and  
forcing the first of the two communicating devices to retransfer to the  
second of the two communicating devices the specific  
information packet which could not be accepted by the second  
10 of the two communication devices.

5. The method of communication of claim 1 further comprising:  
before receiving the acknowledge response, transmitting additional  
information packets following the predetermined order and  
15 creating an indicator within the first of the two  
communicating devices to indicate an order value of a next  
information packet to be transferred.

6. The method of communication of claim 1 further comprising:  
20 including with the acknowledge response from the second of the two  
communicating devices a present value of the order number  
which the second of the two communicating devices used to  
decide to accept or reject a presently pending information  
packet being processed.

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- 5     7.     The method of communication of claim 1 further comprising:
- checking for communication errors at the second of the two
- communicating devices by implementing a predetermined
- error checking scheme of the information packets which the
- second of the two communicating devices receives.

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8.     The method of communication of claim 1 further comprising:
- implementing the system as a source synchronous system by
- transmitting a clock with the information packets.

- 15     9.     The method of communication of claim 1 further comprising:
- clocking the first of the two communicating devices with a first clock
- signal and clocking the second of the two communicating
- devices with a second clock signal, the first clock signal and
- the second clock signal being asynchronous with respect to
- each other.

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10.     The method of communication of claim 1 further comprising:
- coupling a third communicating device to the second of the two
- communicating devices, the first of the two communicating

5 devices communicating the information packets to the third  
communicating device by following the steps of claim 1; and  
repeating the steps of claim 1 between the second of the two  
communicating devices and the third communicating device,  
thereby eliminating delivery responses between the first of the  
10 two communicating devices and the third communicating  
device.

11. A device for use in a system, the device adapted to transmit and receive  
information packets with an additional device, the device comprising:

15 assembly circuitry for creating and transmitting information packets,  
each of which has an assigned known order number from a  
plurality of order values, and organizing the order values in a  
predetermined order which the information packets must be  
transmitted and received in;

20 acknowledgement circuitry for receiving responses from the  
additional device indicating whether the additional device  
successfully received an information packet of correct order  
value;

tracking circuitry coupled to the acknowledgement circuitry and the  
25 assembly circuitry for maintaining an indication of a current

5 order value of an information packet which is to be next  
approved by the additional device and an indication of a next  
order value of an information packet which is to be next  
transmitted, the tracking circuitry controlling the assembly  
and transmission of information packets by the assembly  
10 circuitry;

parsing circuitry for receiving information packets from the  
additional device, the parsing circuitry separating a data field  
from an order number field of each of the information packets;  
comparison circuitry coupled to the parsing circuitry for comparing a  
15 received order number with an authorized order number for a  
next authorized information packet to be received;  
error detection circuitry coupled to the parsing circuitry for receiving  
the data field of each of the information packets and  
determining whether any data errors exist, the error detection  
20 circuitry providing an error signal in response to detection of  
an error;

storage and logic circuitry for determining if resources exist to store  
the next authorized information packet to be received and for  
storing the next authorized information packet;

5            acknowledge circuitry coupled to the comparison circuitry, to the  
error detection circuitry and to the storage and logic circuitry,  
the acknowledge circuit providing an acknowledge response  
to the additional device indicating whether the next  
authorized information packet was received, had no errors  
10           and could be stored.

12.    The device of claim 11 further comprising:

an outbound information packet queue coupled to the assembly  
circuitry for storing data portions of information packets prior  
15           to transmission;  
and wherein the storage and logic circuitry further comprises an  
inbound information packet queue for storing data portions of  
received information packets upon approval of a received  
information packet by the acknowledge circuitry.

20           13.    The device of claim 12 wherein the information packets each comprise a first  
field which comprises the plurality of order values, a second field which  
comprises an attributes field, and a third field which comprises a data field.



5 14. The device of claim 12 wherein the tracking circuitry further comprises a scoreboard register, the scoreboard register having a storage location for each of the plurality of order values, a first pointer value which indicates an expected order value to be next acknowledged by the acknowledge response, and a second pointer value which indicates a next order value to be used in connection with a transmitted information packet.

15. A method of communicating information packets between a transmitting device and a receiving device, comprising:

ordering the information packets in a predetermined order to be

transmitted and received;

transmitting the information packets solely in the predetermined

order from the transmitting device to the receiving device;

receiving the information packets solely in the predetermined order

with the receiving device and successively checking each

received information packet to determine if each information

packet can be accepted;

providing a response from the receiving device to the transmitting

device, the response indicating if transmitted information

packets are accepted;

5 if a response indicates a rejected information packet due to the  
receiving unit detecting an error associated with the rejected  
information packet, sending a request from the transmitting  
unit to the receiving unit for an order number of the rejected  
information packet and resending information packet  
10 transmission beginning with the order number of the rejected  
information packet;

if a response indicates a rejected information packet due to the  
receiving unit being unable to accept the rejected information  
packet although no specific error associated with the rejected  
15 information packet was found, sending a response to the  
transmitting unit indicating rejection was due to being unable  
to accept the rejection information packet and forcing the  
transmitting unit to back up to the rejected information packet  
and retransmit the rejected information packet.

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16. The method of claim 15 further comprising:

using a scoreboard register in the transmitting device to indicate  
what ordering value is associated with a next response from  
the receiving device associated with a transmitted information

5 packet and to indicate what ordering value is associated with a  
next information packet transmission.

17. The method of claim 15 further comprising:

10 providing a receiving unit with the transmitting device, the  
receiving unit functioning to receive information  
packets as the receiving device does; and  
providing a transmitting unit with the receiving device, the  
transmitting unit functioning to transmit information  
packets as the transmitting device does,  
15 wherein information packets are bidirectionally communicated  
between the transmitting device and the receiving device.

18. The method of claim 15 further comprising:

clocking the transmitting device with a first clock;  
20 clocking the receiving device with a second clock which is  
asynchronous with first clock.

19. The method of claim 15 further comprising:

before receiving a response from the receiving device regarding a  
25 first transmitted information packet, transmitting one or more

5 additional information packets in predetermined order to the receiving device.

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